

## Claims

What is claimed is:

1. A distal protection assembly, comprising:  
  
an outer sheath having a proximal end, a distal end, and a lumen extending therethrough;  
  
an inner shaft disposed within the lumen, the inner shaft having a proximal end and a distal end;  
  
a distal protection device disposed at the distal end of the inner shaft;  
  
a manifold coupled to the proximal end of the inner shaft, the manifold including an actuator assembly; and  
  
the actuator assembly coupled to the proximal end of the outer sheath and capable of moving the outer sheath relative to the inner shaft.
2. The distal protection assembly in accordance with claim 1, wherein the distal protection device comprises a filter.
3. The distal protection assembly in accordance with claim 1, wherein the distal protection device comprises a mesh.
4. The distal protection assembly in accordance with claim 1, wherein the distal protection device comprises a strut.

5. The distal protection assembly in accordance with claim 1, wherein the distal protection device comprises a rib.

6. The distal protection assembly in accordance with claim 1, wherein the actuator assembly includes a button.

7. The distal protection assembly in accordance with claim 6, wherein the button is longitudinally movable.

8. The distal protection assembly in accordance with claim 6, further comprising an actuator retention cover.

9. The distal protection assembly in accordance with claim 1, wherein the actuation assembly includes a gear.

10. The distal protection assembly in accordance with claim 9, further comprising a proximal tubular member coupled to the outer sheath.

11. The distal protection assembly in accordance with claim 10, wherein the proximal tubular member further comprises teeth.

12. The distal protection assembly in accordance with claim 11, wherein the gear is engagable with the teeth.

13. The distal protection assembly in accordance with claim 12, wherein the actuator assembly further comprises a thumbwheel coupled to the gear.

14. The distal protection assembly in accordance with claim 12, wherein the actuator assembly further comprises a button coupled to the gear.

15. The distal protection assembly in accordance with claim 14, wherein pressing the button moves the outer sheath distally relative to the inner shaft.

16. The distal protection assembly in accordance with claim 14, wherein pressing the button moves the outer sheath proximally relative to the inner shaft.

17. The distal protection assembly in accordance with claim 14, wherein the button is axially rotatable.

18. The distal protection assembly in accordance with claim 17, wherein axial rotation of the button results in movement of the outer sheath relative to the inner shaft.

19. The distal protection assembly in accordance with claim 12, wherein the actuation assembly further comprises a second gear and a second button.

20. The distal protection assembly in accordance with claim 19, wherein pressing the second button moves the outer tube in a direction that is opposite to pressing the first button.

21. A distal protection assembly, comprising:

an outer sheath having a proximal end, a distal end, a lumen extending therethrough, and a proximal tubular member tube coupled to the proximal end;

the proximal tubular member including teeth;

an inner shaft disposed within the lumen, the inner shaft having a proximal end and a distal end;

a distal protection device disposed at the distal end of the inner shaft;

a manifold coupled to the proximal end of the inner shaft, the manifold including an actuator assembly;

the actuator assembly having a gear that is engagable with the teeth; and

wherein the actuator assembly is coupled to the proximal tubular member and capable of moving the outer sheath relative to the inner shaft.

22. The distal protection assembly in accordance with claim 21, wherein the distal protection device comprises a filter.

23. The distal protection assembly in accordance with claim 21, wherein the distal protection device comprises a mesh.

24. The distal protection assembly in accordance with claim 21, wherein the distal protection device comprises a strut.

25. The distal protection assembly in accordance with claim 21, wherein the distal protection device comprises a rib.

26. The distal protection assembly in accordance with claim 21, wherein the actuation assembly includes a thumbwheel coupled to the gear.

27. The distal protection assembly in accordance with claim 21, wherein the actuator assembly further comprises a button coupled to the gear.

28. The distal protection assembly in accordance with claim 27, wherein pressing the button moves the outer sheath distally relative to the inner shaft.

29. The distal protection assembly in accordance with claim 27, wherein pressing the button moves the outer sheath proximally relative to the inner shaft.

30. The distal protection assembly in accordance with claim 27, wherein the button is axially rotatable.

31. The distal protection assembly in accordance with claim 30, wherein axial rotation of the button results in movement of the outer sheath relative to the inner shaft.

32. The distal protection assembly in accordance with claim 21, wherein the actuation assembly further comprises a second gear and a second button.

33. The distal protection assembly in accordance with claim 32, wherein pressing the second button moves the outer tube in a direction that is opposite to pressing the button.

34. A method of actuating a distal protection assembly, comprising the steps of:

providing a distal protection assembly including an outer sheath having a proximal end, a distal end, and a lumen extending therethrough; an inner shaft disposed within the lumen, the inner shaft having a proximal end and a distal end; a distal protection device disposed at the distal end of the inner shaft; a manifold coupled to the proximal end of the inner shaft, the manifold including an actuator assembly; and the actuator assembly coupled to the proximal end of the outer sheath and capable of moving the outer sheath relative to the inner shaft;

actuating the actuator assembly; and

wherein actuating the actuator assembly shifts the distal protection device between a delivery position and a retrieval position.

35. The method in accordance with claim 34, wherein the step of actuating the actuator assembly further comprises collapsing the distal protection device.

36. The method in accordance with claim 34, wherein the step of actuating the actuator assembly further comprises expanding the distal protection device.

37. The method in accordance with claim 34, wherein the actuator assembly includes a gear.

38. The method in accordance with claim 37, wherein the gear is engageable with a proximal tubular member disposed at the distal end of the outer sheath.

39. The method in accordance with claim 38, wherein the step of actuating the actuator assembly further comprises rotating a thumbwheel coupled to the gear.

40. The method in accordance with claim 38, wherein the actuator assembly further comprises a button coupled to the gear and wherein the step of actuating the actuator assembly includes pressing the button.

41. The method in accordance with claim 40, wherein the step of pressing the button results in the outer sheath moving distally relative to the inner shaft.

42. The method in accordance with claim 40, wherein the step of pressing the button results in the outer sheath moving proximally relative to the inner shaft.

43. The method in accordance with claim 40, wherein the actuator assembly further comprises a second gear and a second button coupled to the proximal tubular member and wherein the step of actuating the actuator further comprises pressing the second button.

44. The method in accordance with claim 43, wherein pressing the second button moves the outer tube in a direction that is opposite to pressing the button.

45. The method in accordance with claim 38, wherein the step of actuating the actuator assembly includes axially rotating a button and wherein rotating the button results in movement of the outer sheath relative to the inner shaft.